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EXAMINER	
CANTELMO, GREGG	

ART UNIT	PAPER NUMBER
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/997,693	ACKER ET AL.	
	Examiner	Art Unit	
	Gregg Cantelmo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21 and 23-40* is/are rejected.

7)☒ Claim(s) *22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 January 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a)☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *04302002*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Priority

1. Applicant's claim for domestic priority to U.S. provisional Application No. 60/250,592 is acknowledged.

Information Disclosure Statement

2. The information disclosure statement filed April 30, 2002 has been placed in the application file and the information referred to therein has been considered as to the merits. U.S. patent 5,559,638 (not to Surampudi et al. as listed on the IDS) has not been considered since it is drawn to a reference which is not pertinent to the claimed invention, particularly this reference is a patent to wide-angle lenses. It may be that this citation should be 5,599,638.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the first and second materials disposed on a plurality of third materials (claim 5) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: of the first material and second material as recited in claim 5 wherein these materials are disposed on a plurality of third materials, and the third materials are fastened together; of the value or range of values which define the term "substantial" as recited in claim 7.

5. The disclosure is objected to because of the following informalities: the specification teaches that PVDF is "polyvaniladine fluoride" which is counter to all known teachings of PVDF being polyvinylidinefluoride. Appropriate correction is required.

Claim Objections

6. Claims 16 and 17 are objected to because of the following informalities: the claims do not end with a period. Appropriate correction is required.

7. The term "substantial" in claim 7 is a relative term which renders the claim indefinite. The term "substantial" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The specification does not define a value or range of values which were appreciated by the instant application at the time the claimed invention was made as "substantial".

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claim 14 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. ZINTEX is not held to be a material known to one of ordinary skill in the art and one of ordinary skill in the art would not have known what materials are held as comprising ZINTEX.

10. Claim 13 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. polyvaniladine is not held to be a material known to one of ordinary skill in the art and one of ordinary skill in the art would not have known what materials are held as comprising polyvaniladine.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 9, 10, 14. 31, 37 and 40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 9 recites "phosphotungsti acid". It would appear that this should be "phosphotunstic acid" and has been interpreted as such.

b. Claims 9, 10, 14 and 31 contains the trademark/trade name NAFION, TEFLON and ZINTEX. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name.

c. Claim 9 is indefinite. It is unclear if the Teflon listed in the claim is the Teflon backbone of NAFION or a separate and distinct entity from the NAFION itself;

d. Claim 13 is indefinite. It is unclear as to what material(s) the term "polyvaniladine" is refers to at the time the claimed invention was made. The specification does not define the term or material(s) which were appreciated as "polyvaniladine".

e. Claim 14 is indefinite. It is unclear as to what material(s) the term ZINTEX is refers to at the time the claimed invention was made. The specification does not define the term or material(s) which were appreciated as ZINTEX;

f. Claims 37 and 40 are indefinite. These claims are drawn to fuel cell systems as defined in independent claims 34 and 38, respectively. Base claims 34 and 38 recite fuel cell systems which include a fuel source *in the system*. Thus the limitations of claims 37 and 40 reciting the fuel source being external to the system appears contradictory to the scope of the base claims since the systems have the fuel source therein. Applicant is advised to use clearer terminology with respect to the placement of the fuel source relative to the fuel cell components.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 1-3, 6-8, 18-19, 23 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,547,551 (Bahar).

Bahar discloses a membrane for a fuel cell comprising a proton conducting material and a gas conducting material (col. 5, ll. 41-44 and col. 6, ll. 35-43 as applied to claim 1).

The first field (pores in the second material) holds the first material and the second field is the porous membrane (as applied to claim 2).

A binder is provided to bind the proton conductor in the pores of the membrane (as applied to claim 3).

The first and second materials are blended together. By mixing the materials the blend causes second material to be dispersed within the first material. Each spot occupied by the second material then is held to be a filled opening between the two areas of the first material (col. 7, ll. 13-15 as applied to claim 6).

The first material comprises a hydrophilic polymer having "substantial" water affinity, proton conducting capacity and oxidation resistance (col. 6, ll. 35-43 as applied to claim 7).

The first material comprises perfluorosulfonic acid substituted polytetrafluoroethylene (col. 12, ll. 53-54 as applied to claim 8).

The second material comprises expanded PTFE (col. 5, ll. 41-44 as applied to claim 15).

The first and second materials are blended into a single layer (Fig. 1 as applied to claim 18).

At least a portion of membrane which will include plural second material portions spaced relative to the first material (abstract and Figs. 1 and 3-5 as applied to claim 19).

The first material and second materials are distinct from one another and thus are separate (as applied to claim 23).

15. Claims 1-3, 6-8, 17-19 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by EP 577291A (EP '291).

EP '291 discloses a membrane comprising a proton conducting polymer and a second gas-conducting polymer (abstract and col. 5, ll. 20-33 as applied to claim 1). While this membrane is called an electrode, claim 1 does not include any limitations which distinguish an electrode membrane from an electrolyte membrane. Additionally the electrode conducts ions and gas as would an electrolyte membrane and thus can be reasonably interpreted as an electrolyte membrane material (as applied to claims 1 and 33).

The materials are separate and distinct from each other and thus constitute first and second "fields". The claim does not provide sufficient specificity as to the nature of the term field and thus the term is reasonably interpreted to be regions having distinct first polymer and second polymer (as applied to claim 2).

The polymers are bonded together (col. 7 as applied to claim 3).

The first and second materials are blended together. By mixing the materials the blend causes second material to be dispersed within the first material. Each spot occupied by the second material then is held to be a filled opening between the dispersed first material (col. 7, ll. 13-15 as applied to claim 6).

The first material is Nafion (col. 9, ll. 35-50 as applied to claims 7 and 8).

The first material is coated with a platinum catalyst (col. 9, ll. 35-50 as applied to claim 17).

The first and second materials are blended into a single layer (col. 10, ll. 16-42 as applied to claim 18).

The first and second materials are blended together. By mixing the materials the blend causes second material to be dispersed within the first material. At least a portion of which will include plural second material portions spaced relative to the first material (col. 7, ll. 13-15 as applied to claim 19).

The first material and second materials are distinct materials as discussed above and thus separate from each other (as applied to claim 23).

16. Claim 24 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,945,231 (Narayanan)

Narayanan discloses a fuel cell comprising a material for conducting protons and plural gas inlets and outlets (venting array) in communication with both sides of the membrane for conducting reactant and product gases in the fuel cell (Fig. 1 as applied to claim 24).

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

17. Claims 1-3, 5-7, 9, 10, 17-19, 20, 21 and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. patent No. 6,456,136 (Fenton).

Fenton discloses a membrane electrolyte comprising a proton conducting first material and a second gas conducting material (abstract as applied to claim 1).

The materials are separate and distinct from each other and thus constitute first and second "fields". The claim does not provide sufficient specificity as to the nature of the term field and thus the term is reasonably interpreted to be regions having distinct first polymer and second polymer (as applied to claim 2).

The materials are bonded together (abstract as applied to claim 3).

The first and second materials form the electrolyte 7 which is disposed on third materials 3 and 5 which are all compressed together (Fig. 1 as applied to claim 5).

The first and second materials are blended together. By mixing the materials the blend causes second material to be dispersed within the first material. Each spot occupied by the second material then is held to be a filled opening between the dispersed first material and vice versa (abstract as applied to claim 6).

The first material is a hydrophilic polymer such as phosphotunstic acid and Nafion (col. 9, ll. 1-60 as applied to claim 7).

Fenton teaches of NAFION (having an inherent Teflon constituent therein) and phosphotungstic acid or zirconium hydrogen phosphate (col. 2, ll. 33-46 as applied to claims 9 and 10).

The first material is coated with a catalyst (col. 6, ll. 7-17 as applied to clam 17).

The first and second materials are blended into a single layer (abstract as applied to claim 18).

The first and second materials are blended together. By mixing the materials the blend causes second material to be dispersed within the first material. At least a

portion of which will include plural second material portions spaced relative to the first material (Figs. 2 and 3 as applied to claim 19).

The first and second materials are dispersed along the width and length of the electrolyte (Figs. 2 and 3 as applied to claims 20 and 21).

The first material and second materials are distinct materials as discussed above and thus separate from each other (as applied to claim 23).

18. Claims 1-2, 7, 13, 15, 18, 20, 21 and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. patent No. 6,015,610 (Minor).

Minor discloses a membrane comprising a proton conducting PVDF first material and a second expanded PTFE gas conducting material (col. 12, ll. 40-50 as applied to claim 1). While this membrane is not expressly called an electrolyte, claim 1 does not include any limitations which distinguish an electrolyte membrane from any membrane having the same constituents as recited in the claims.

The materials are separate and distinct from each other and thus constitute first and second "fields". The claim does not provide sufficient specificity as to the nature of the term field and thus the term is reasonably interpreted to be regions having distinct first polymer and second polymer (as applied to claim 2).

The first material is a hydrophilic polymer such as PVDF (col. 12, ll. 40-50 as applied to claim 7).

The first material comprises PVDF (as discussed above and applied to claim 13).

The second material comprises expanded PTFE (as discussed above and applied to claim 15).

The first material is coated into the pores of the second material to form a single layer (col. 12, ll. 40-50 as applied to claim 18).

The first and second materials are dispersed along the width and length of the electrolyte (col. 12, ll. 40-50 as applied to claims 20 and 21).

The first material and second materials are distinct materials as discussed above and thus separate from each other (as applied to claim 23).

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

20. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bahar in view of either U.S. patent No. 5,919,583 (Grot) or U.S. patent No. 6,456,136 (Fenton).

The teachings of claim 1 with respect to Bahar have been discussed above and are incorporated herein.

The differences between instant claims 9 and 10 and Bahar are that Bahar does not teach of the proton conducting material comprising the specific claimed materials.

Grot teaches of NAFION (having an inherent Teflon constituent therein) and a phosphate of zirconium or titanium (paragraph bridging columns 5 and 6 as applied to

claims 9 and 10) and by example zirconium hydrogen phosphate (claim 10) as an ion conducting material (col. 7, ll. 5-27 and Example 1).

Fenton teaches of NAFION (having an inherent Teflon constituent therein) and phosphotungstic acid or zirconium hydrogen phosphate (col. 2, ll. 33-46).

The motivation for using this material as the proton conducting inorganic filler material is that it provides a filler which reduces reactant gas crossover while having superior proton conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bahar in view of either Grot or Fenton by using NAFION with either phosphotungstic acid or zirconium hydrogen phosphate as a proton conducting inorganic filler material since it would have provided a filler which prevents reactant gas crossover while having superior proton conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

21. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bahar in view of WO 97/19480A (WO '480).

The teachings of claim 1 with respect to Bahar have been discussed above and are incorporated herein.

The differences between instant claim 11 and Bahar is that Bahar does not teach of the proton conducting material comprising the specific claimed material.

WO '480 teaches of using H-SPEEK as a proton conducting material (page 17, ll. 1-12).

The motivation for using PEEK is that it provides an electrolyte material having superior ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bahar in view of WO '480 by using PEEK in the electrolyte membrane since it would have provided an electrolyte material having superior ionic conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

22. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bahar in view of U.S. patent No. 5, 525,436 (Savinell).

The teachings of claim 1 with respect to Bahar have been discussed above and are incorporated herein.

The differences between instant claim 12 and Bahar is that Bahar does not teach of the proton conducting material comprising the specific claimed material.

Savinell teaches that films comprising polymers containing basic groups that can form complexes with stable acids or polymers containing acidic groups provide a viable alternative to known PEM's and other conventional electrolytes. Polybenzimidazole (PBI) which has been doped with a strong acid, such as phosphoric acid or sulfuric acid, is an example of a suitable polymer. Polybenzimidazoles, along with other suitable

aromatic polymers, basic enough to complex with acids, exhibit excellent oxidative and thermal stability characteristics, these properties being further enhanced by doping at a level of at least 200 mol %. They require low water activity, thus avoiding operating temperature limits due to the boiling point of water. Capability to operate at elevated temperatures, i.e. up to at least 200.degree. C., also reduces the potential for anode/cathode poisoning. Further, they do not suffer significantly from methanol cross-over because of low methanol swelling with methanol vapor and high glass transition temperatures.

The motivation for using PBI in the electrolyte membrane is that it provides a material having excellent oxidative and thermal stability characteristics, require low water activity, reduce electrode poisoning and reduce reactant crossover.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bahar in view of Savinell by using PBI in the electrolyte membrane since it would have provided a material having excellent oxidative and thermal stability characteristics, require low water activity, reduce electrode poisoning and reduce reactant crossover. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

23. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bahar in view of JP 11-086630-A (JP '630).

The teachings of claim 1 with respect to Bahar have been discussed above and are incorporated herein.

The differences between instant claim 13 and Bahar is that Bahar that does not teach of the proton conducting material comprising the specific claimed material.

JP '630 teaches that it is known to use PVDF as an ionic conducting material in solid electrolytes because it has superior ionic conductivity.

The motivation for using PVDF in the electrolyte membrane is that it provides an ionic conducting material in solid electrolytes because it has superior ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bahar in view of JP 630 by using PVDF in the electrolyte membrane since it would have provided an ionic conducting material in solid electrolytes because it has superior ionic conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

24. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bahar in view of either JP 08-088007-A (JP '007), U.S. patent No. 5,176,966 (Epp), or U.S. patent No. 5,573,162 (Van Dine).

The teachings of claim 1 with respect to Bahar have been discussed above and are incorporated herein.

The differences between instant claim 15 and Bahar is that Bahar does not teach of the providing a catalyst coating on the membrane electrode.

The membrane is used as an electrolyte layer of a fuel cell. In forming the fuel cell array, a catalytic layer is provided adjacent to the electrolyte layer and electrodes to catalyze the reactant gases and effectively generate electricity (as shown in the Figs. 1 and 2 of JP '007 and Fig. 1 of Van Dine). The catalyst promotes electrochemical reaction of hydrogen and oxygen, thereby producing electrical current (col. 8, ll. 6-10 of Epp).

The motivation for providing a catalyst layer on the electrolyte membrane is to form a region between the electrolyte and electrode so as to catalyze the reactant gases and generate electricity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bahar in view of either JP '007 or Van Dine by providing a catalyst layer on the electrolyte membrane since it would have formed a region between the electrolyte and electrode so as to catalyze the reactant gases and generate electricity.

25. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fenton in view of WO 97/19480A (WO '480).

The teachings of claim 1 with respect to Fenton have been discussed above and are incorporated herein.

The differences between instant claim 11 and Fenton is that Fenton does not teach of the proton conducting material comprising the specific claimed material.

WO '480 teaches of using H-SPEEK as a proton conducting material (page 17, ll. 1-12).

The motivation for using PEEK is that it provides an electrolyte material having superior ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fenton in view of WO '480 by using PEEK in the electrolyte membrane since it would have provided an electrolyte material having superior ionic conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

26. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fenton in view of U.S. patent No. 5, 525,436 (Savinell).

The teachings of claim 1 with respect to Fenton have been discussed above and are incorporated herein.

The differences between instant claim 12 and Fenton is that Fenton does not teach of the proton conducting material comprising the specific claimed material.

Savinell teaches that films comprising polymers containing basic groups that can form complexes with stable acids or polymers containing acidic groups provide a viable alternative to known PEM's and other conventional electrolytes. Polybenzimidazole (PBI) which has been doped with a strong acid, such as phosphoric acid or sulfuric acid, is an example of a suitable polymer. Polybenzimidazoles, along with other suitable

aromatic polymers, basic enough to complex with acids, exhibit excellent oxidative and thermal stability characteristics, these properties being further enhanced by doping at a level of at least 200 mol %. They require low water activity, thus avoiding operating temperature limits due to the boiling point of water. Capability to operate at elevated temperatures, i.e. up to at least 200.degree. C., also reduces the potential for anode/cathode poisoning. Further, they do not suffer significantly from methanol cross-over because of low methanol swelling with methanol vapor and high glass transition temperatures.

The motivation for using PBI in the electrolyte membrane is that it provides a material having excellent oxidative and thermal stability characteristics, require low water activity, reduce electrode poisoning and reduce reactant crossover.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fenton in view of Savinell by using PBI in the electrolyte membrane since it would have provided a material having excellent oxidative and thermal stability characteristics, require low water activity, reduce electrode poisoning and reduce reactant crossover. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

27. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fenton in view of JP 11-086630-A (JP '630).

The teachings of claim 1 with respect to Fenton have been discussed above and are incorporated herein.

The differences between instant claim 13 and Fenton is that Fenton that does not teach of the proton conducting material comprising the specific claimed material.

JP '630 teaches that it is known to use PVDF as an ionic conducting material in solid electrolytes because it has superior ionic conductivity.

The motivation for using PVDF in the electrolyte membrane is that it provides an ionic conducting material in solid electrolytes because it has superior ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fenton in view of JP '630 by using PVDF in the electrolyte membrane since it would have provided an ionic conducting material in solid electrolytes because it has superior ionic conductivity. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

28. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fenton in view of either JP 08-088007-A (JP '007), U.S. patent No. 5,176,966 (Epp), or U.S. patent No. 5,573,162 (Van Dine).

The teachings of claim 1 with respect to Fenton have been discussed above and are incorporated herein.

The differences between instant claim 15 and Fenton is that Fenton does not teach of the providing a catalyst coating on the membrane electrode.

The membrane is used as an electrolyte layer of a fuel cell. In forming the fuel cell array, a catalytic layer is provided adjacent to the electrolyte layer and electrodes to catalyze the reactant gases and effectively generate electricity (as shown in the Figs. 1 and 2 of JP '007 and Fig. 1 of Van Dine). The catalyst promotes electrochemical reaction of hydrogen and oxygen, thereby producing electrical current (col. 8, ll. 6-10 of Epp).

The motivation for providing a catalyst layer on the electrolyte membrane is to form a region between the electrolyte and electrode so as to catalyze the reactant gases and generate electricity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fenton in view of either JP '007 or Van Dine by providing a catalyst layer on the electrolyte membrane since it would have formed a region between the electrolyte and electrode so as to catalyze the reactant gases and generate electricity.

29. Claims 25-27 and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,176,966 (Epp) in view of either Bahar or Fenton.

Epp teaches of an MEA in Fig. 6 comprising: an electrolyte membrane 43, first and second catalyst layers 54 disposed on opposing sides of membrane 43, and gas diffusion layers 44 and 50 (Fig. 6 as applied to claim 25).

Layers 44 and 50 comprise carbon fiber paper (col. 8, ll. 20-22 as applied to claims 26 and 27).

The fiber papers 44 and 50 are treated with a Teflon additive (col. 8, ll. 20-35 as applied to claims 29 and 30).

The carbon paper has inherent channels which permit the flow of gas to and from the electrolyte membrane, thereby generating electric current (as applied to claim 32).

The difference between instant claim 25 and Epp is that Epp does not teach of the electrolyte layer having first and second materials as recited therein.

Both Fenton and Bahar teach of electrolyte materials having a first material which is proton conducting and a second material which is gas evolving (as discussed in the anticipatory rejections above, incorporated herein).

The motivation for using the electrolyte membranes of either Fenton or Bahar is that it provides an ultra-thin composite membrane having excellent ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Epp by using the electrolyte membrane of either Bahar or Fenton since it would have provided an ultra-thin composite membrane having excellent ionic conductivity.

30. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Epp in view of either Bahar or Fenton as applied to claims 25-27 and 30-32 above, and further in view of U.S. patent No. 5,798,186 (Fletcher).

The teachings of claim 25 have been discussed above, incorporated herein.

The difference not yet discussed is of the porous carbon being a carbon cloth.

Fletcher teaches that both carbon fiber paper and carbon cloth are known equivalent gas diffusive layers for use in MEAs (col. 1, ll. 15 -29).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Epp by using carbon cloth or carbon fiber paper as the gas diffusive layer since both materials are shown by Fletcher to be equivalent materials for use as such. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

31. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Epp in view of either Bahar or Fenton as applied to claims 25-27 and 30-32 above, and further in view of U.S. patent No. 4,248,682 (Lindstrom).

The teachings of claim 25 have been discussed above, incorporated herein.

The difference not yet discussed is of the gas diffusion layer including a thickness between approximately 150-400 microns.

Lindstrom teaches that carbon gas diffusion electrodes having preferred thicknesses between 10 and 35 mils (254-889 microns) has long since been established in the art (col. 3, ll. 55-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Epp by selecting the gas diffusion layer(s) to include a thickness between approximately 150-400 microns since such thicknesses are shown to provide gas diffusion members having optimal

electromechanical properties. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesche , 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985).

32. Claims 25-27, 32-33, and 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,945,231 (Narayanan) in view of either Bahar or Fenton.

Narayanan discloses a fuel cell comprising a housing 102 forming an anode chamber 122 and a cathode chamber 132, proton conducting membrane electrolyte 110, catalyst layers proximate the electrolyte (Figs. 1-3B), and gas diffusion layers (col. 3, ll. 30-50 as applied to claims 25 and 33-35 and 38).

The fuel cell comprises a housing as further defined in claim 33.

The fuel cell comprises a housing and electrode chambers as further defined in claims 34 and 35.

The fuel cell comprises a fuel delivery device and fuel source having a carbonaceous fuel in fluid communication with the fuel delivery device, gas inlets and

outlets to both the anode chamber and cathode chamber (Fig. 1) as further defined in claim 35.

The fuel cell comprises a fuel delivery device, fuel source in fluid communication with the fuel delivery device, anode chamber having a gas inlet for receiving the fuel mixture, cathode having an inlet and outlet (Fig. 1) as further defined in claim 38.

The backing layer can be a carbon fiber sheet (col. 3, ll. 43-44 as applied to claims 26 and 27).

The carbon paper has inherent channels which permit the flow of gas to and from the electrolyte membrane, thereby generating electric current (as applied to claim 32).

With respect to claims 36-37 and 39-40:

The fuel source is a part of the fuel cell system and is internal to the fuel cell system (Fig. 1 as applied to claims 36 and 39).

The fuel cell source is external to the fuel cell stack component of the system (Fig. 1 as applied to claims 37 and 40).

The difference between instant claims 25 and 33-35 and Narayanan is that Narayanan does not teach of the electrolyte layer having first and second materials as recited therein.

Both Fenton and Bahar teach of electrolyte materials having a first material which is proton conducting and a second material which is gas evolving (as discussed in the anticipatory rejections above, incorporated herein).

The motivation for using the electrolyte membranes of either Fenton or Bahar is that it provides an ultra-thin composite membrane having excellent ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by using the electrolyte membrane of either Bahar or Fenton since it would have provided an ultra-thin composite membrane having excellent ionic conductivity.

33. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of either Bahar or Fenton as applied to claims 25-27, 32, and 34-40 above, and further in view of U.S. patent No. 5,798,186 (Fletcher).

The teachings of claim 25 have been discussed above, incorporated herein.

The difference not yet discussed is of the porous carbon being a carbon cloth.

Fletcher teaches that both carbon fiber paper and carbon cloth are known equivalent gas diffusive layers for use in MEAs (col. 1, ll. 15 -29).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by using carbon cloth or carbon fiber paper as the gas diffusive layer since both materials are shown by Fletcher to be equivalent materials for use as such. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

34. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of either Bahar or Fenton as applied to claims 25-27, 32, and 34-40 above, and further in view of U.S. patent No. 4,248,682 (Lindstrom).

The teachings of claim 25 have been discussed above, incorporated herein.

The difference not yet discussed is of the gas diffusion layer including a thickness between approximately 150-400 microns.

Lindstrom teaches that carbon gas diffusion electrodes having preferred thicknesses between 10 and 35 mils (254-889 microns) has long since been established in the art (col. 3, ll. 55-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by selecting the gas diffusion layer(s) to include a thickness between approximately 150-400 microns since such thicknesses are shown to provide gas diffusion members having optimal electromechanical properties. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesche , 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985).

35. Claims 30 and 31 rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of either Bahar or Fenton as applied to claims 25-27, 32, and 34-40 above, and further in view of Epp.

The teachings of claim 25 have been discussed above, incorporated herein.

The differences not yet discussed are of providing a Teflon additive to the gas diffusion layer.

The fiber papers 44 and 50 are treated with a Teflon additive (Epp, col. 8, ll. 20-35 as applied to claims 29 and 30).

The motivation for coating the carbon gas diffusion electrode with Teflon is to improve the water repellency of the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by adding Teflon to the carbon electrodes since it would have improve the water repellency of the electrode.

Allowable Subject Matter

36. Claim 22 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

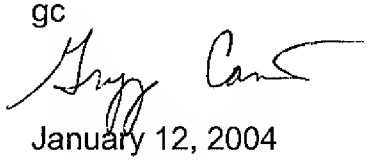
37. The following is a statement of reasons for the indication of allowable subject matter: none of the prior art of record appear to teach, fairly suggest or render obvious the membrane electrolyte of claim 22 wherein the second material is a web of micromesh and wherein the first material comprises a plurality of strips positioned intermittently along the second material.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (571) 272-1283. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached at (571) 272-1292. FAX communications should be sent to FAX number: (703) 872-9306. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1700.

Gregg Cantelmo
Patent Examiner
Art Unit 1745

gc



January 12, 2004